

How Does NASA's Research Investment in Aeronautics Contribute to NextGen?

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NASA Aeronautics

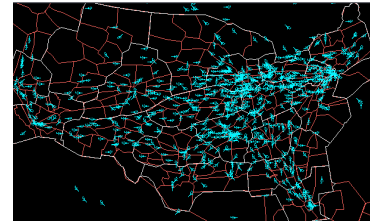
Background

- A white paper “NASA & the NextGen” was developed in 2007
 - The Current National Airspace System
 - The Need for Change
 - The Solution: NextGen
 - So how do we get there from here?
 - So how does NASA’s research investment in Aeronautics contribute to NextGen?
- Download a copy at <http://www.aeronautics.nasa.gov>

Aeronautics Programs

Fundamental Aeronautics Program

Conduct cutting-edge research that will produce innovative concepts, tools, and technologies to enable revolutionary changes for vehicles that fly in all speed regimes.



Airspace Systems Program

Directly address the fundamental ATM research needs for NextGen by developing revolutionary concepts, capabilities, and technologies that will enable significant increases in the capacity, efficiency and flexibility of the NAS.

Fundamental Aeronautics Program

- **Subsonic Fixed Wing (SFW)**

- Develop revolutionary technologies and aircraft concepts with highly **improved performance** while satisfying **strict noise and emission constraints**
- Focus on combustor materials



- **Subsonic Rotary Wing**

- Improved maintenance
- Key aerodynamic

- **Supersonic**

- Eliminate practical vehicle
- Supersonic Mars

- **Hypersonic**

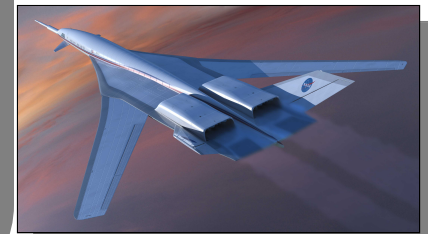
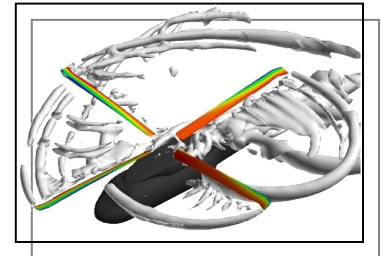
- Fundamental (for launch vehicles) and re-entry into planetary atmospheres
- High-temperature materials, thermal protection systems, advanced propulsion, aero-thermodynamics, multi-disciplinary analysis and design, GNC, advanced experimental capabilities

Subsonic Fixed Wing, Subsonic Rotary Wing, and Supersonics contribute to:

Capacity enhancements via new aircraft new capabilities

Vastly improved performance (fuel burn, take-off and landing)

Significant improvements in environmental impact (noise, emissions, global climate)



Fundamental Aeronautics Program

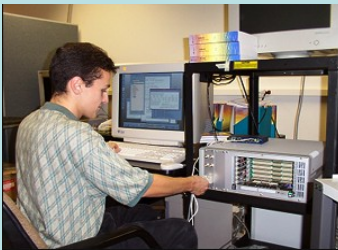
Research Contributions

- Advanced technologies for improvements in:
 - Aircraft performance (fuel burn and take-off/landing field length)
 - Noise (including airport noise and sonic boom)
 - Emissions (NO_x, particulates, UHC, CO₂)
- Predictive tools for system analysis and assessment of alternatives
- Exploration of advanced fleet composition and the impact of aircraft diversity in NextGen
- Fundamental research in alternative fuels for reduced global and local emissions
- Focus on subsonic fixed wing vehicles (N+x, including CESTOL), rotorcraft, and supersonic aircraft

Aviation Safety Program

- Aviation Safety projects seek to overcome safety barriers that could otherwise constrain full realization of NextGen
 - Safety challenges include increased air traffic density, increased reliance on automation, increased diversity of vehicles, and increased complexity in the system.
 - We also need to transition from a diagnostic to a prognostic approach to identifying system-wide safety issues.

Research Thrusts



Integrated Vehicle
Health
Management



Integrated
Intelligent Flight
Deck



Aircraft Aging
& Durability



Integrated
Resilient Aircraft
Control

Airspace Systems Program

Research Focus Areas (RFA)

NextGen - Airportal

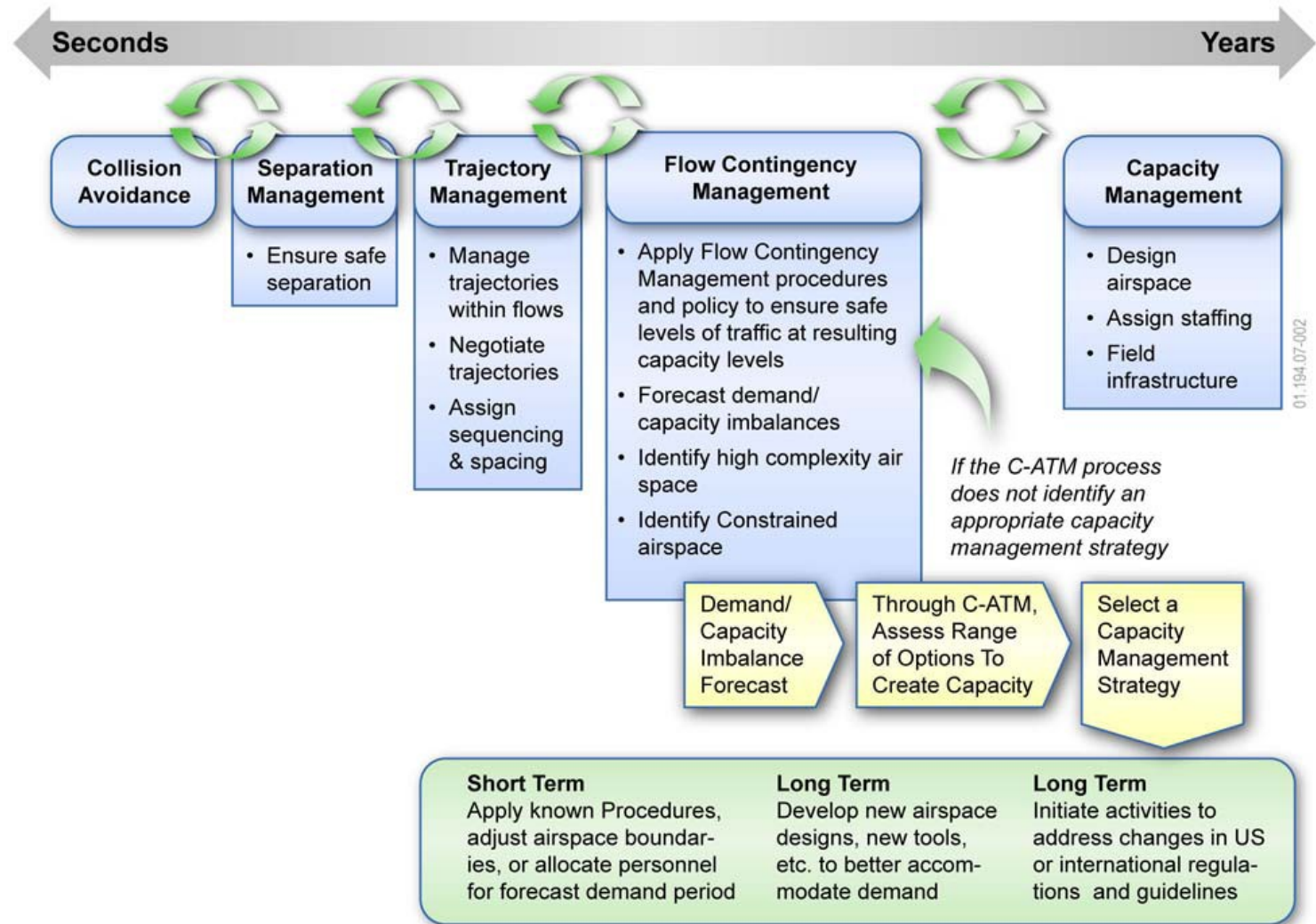
- Safe & Efficient Surface Operations
- Coordinated Arrival/Departure Operations
- Airportal Transition and Integration Management

NextGen - Airspace

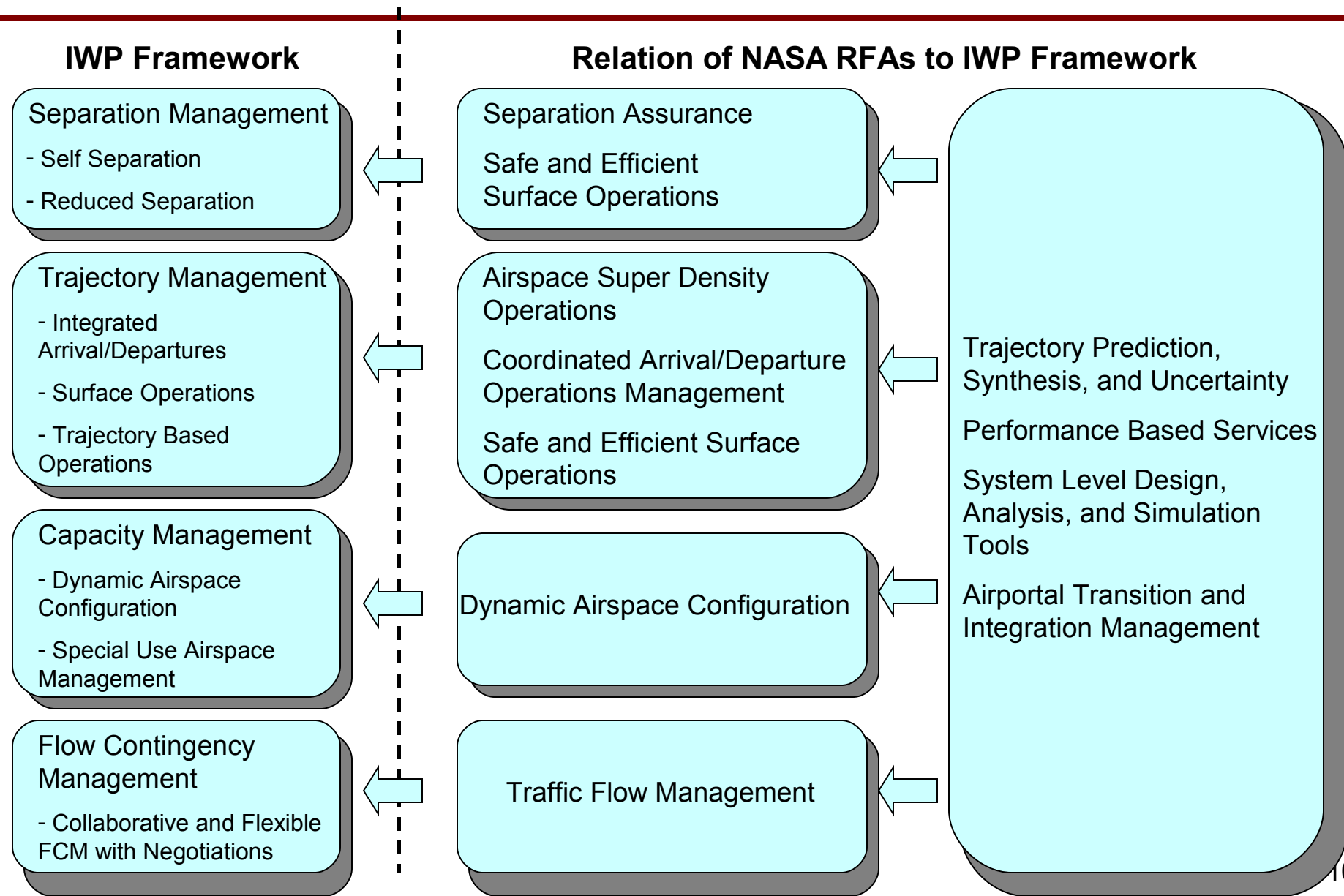
- Dynamic Airspace Configuration
- Traffic Flow Management
- Separation Assurance
- Super Density Operations
- Performance-Based Services
- Trajectory Prediction, Synthesis & Uncertainty
- System-Level Design, Analysis & Simulation Tools

- Both projects conduct system-level design and analysis.
- Results of the two projects are integrated to ensure gate-to-gate solutions that are aligned with NextGen needs.

A Framework for NextGen ATM Decisions



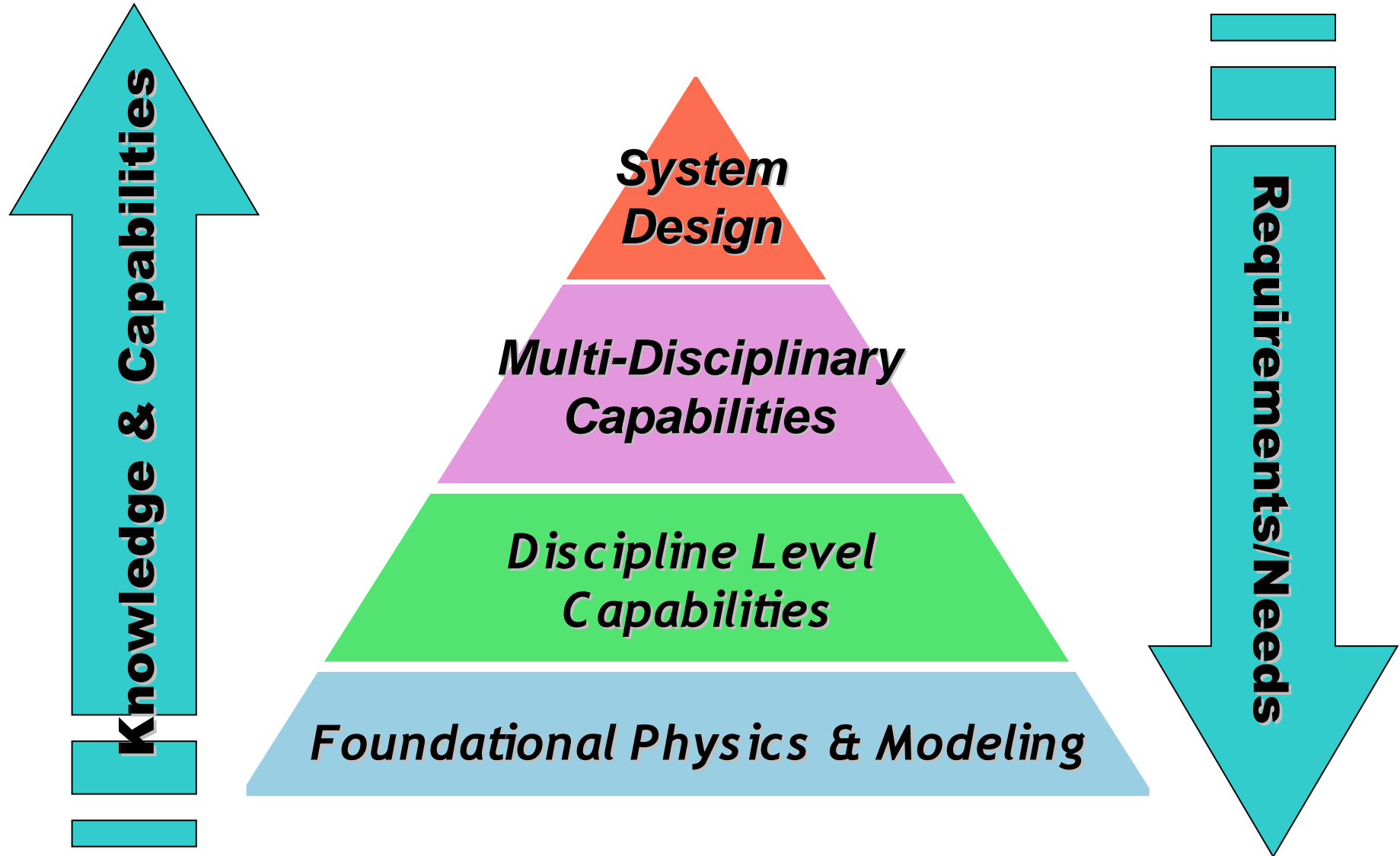
IWP Framework & Project RFAs





Airspace Systems Program Execution & the NASA Research Announcement (NRA)

Aeronautics Research Philosophy



What is the NRA?

- The “Research Opportunities in Aeronautics” NRA is a means to competitively select research
 - It covers a variety of topics in aeronautics fundamental research that are aligned with the work being pursued by Programs
 - Specific research subtopics are outlined in its Appendices
 - Subtopic definition is based on perceived project needs, topics requested in prior solicitations, and overall project balance
 - A portion of each Project’s resources support this NRA
- Some NRA features
 - This NRA encourages collaboration between other organizations and NASA to help achieve specific goals
 - Awards are made as grants, cooperative agreements or contracts, depending on the nature of the proposing organization and/or program requirements
 - Panels of both NASA and external reviewers are used to assess each proposal’s intrinsic scientific and technical merit, its relevance to the Program’s stated objectives, and its cost realism and reasonableness

NRA Schedule

- New subtopics are posted at various times during the year, depending upon Project requirements
- During FY06-07, the NextGen-Airspace and NextGen-Airportal called for proposals in five “rounds”
- Timing from subtopic release through proposal, evaluation and award is approximately 5-6 months

Date	Airspace Round 1	Airspace Round 2	Airspace Round 3	Airportal Round 0	Airportal Round 1
Subtopics Posted	5/24/06	3/23/07	8/24/07	3/23/07	5/23/07
Subtopics Closed	7/7/06	5/7/07	10/11/07	5/7/07	7/6/07
Source Selection	9/1/06	6/21/07	12/4/07	6/21/07	8/23/07
All Awards Completed	11/29/06	8/30/07	TBD	8/24/07	12/21/07

NRA Collaboration

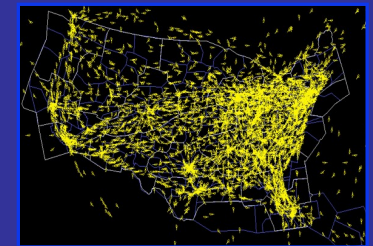
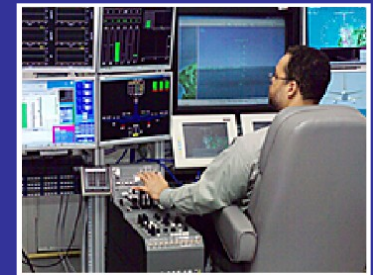
- 132 proposals were received for the 33 subtopics offered by Airspace Systems in FY 2006-2007
- More than 200 reviewers were used in the evaluations including reviewers from FAA and JPDO
- 35 single-year and multi-year awards were completed
 - Awards were made to 18 organizations from 8 states and the District of Columbia
 - 12 universities received 19 awards
 - 6 companies received 16 awards
 - Initial award funding totals about \$19.5M
 - Award values vary with annual awards currently ranging from about \$100K to \$6M
 - Award negotiations are in process for 10 subtopics (18 proposals received) and one subtopic is being evaluated (3 proposals received)
- A listing and searchable database of awards can be accessed at <http://www.aeronautics.nasa.gov/nra.htm>

NRA Award Distribution across Project RFAs

Research Focus Area (RFA)	Awards
Separation Assurance	4
Airspace Super Density Operations	3
Dynamic Airspace Configuration	3
Traffic Flow Management	10
Trajectory Prediction, Synthesis & Uncertainty	4
Performance Based Services	3
System-Level Design, Analysis and Simulation Tools	2
Safe & Efficient Surface Operations	3
Coordinated Arr/Dep Operations Management	0
Airportal Transition and Integration Management	3

Integration of Advanced Vehicles and Concepts into NextGen

- Goal of the study is to research issues associated with deploying new or advanced air vehicles within NextGen in order to:
 - Understand how advanced vehicles will operate within NextGen
 - Understand the tradeoffs involved for both vehicles and the ATM system, including safety considerations, system performance, environmental constraints, and other relevant issues
 - Indicate the most productive areas for future ATM, vehicle, and safety research
- Broad community engagement and coordination with JPDO is expected
- NRA status:
 - Pre-proposal Conference held Aug 9, attended by over 120 people from 90 different organizations
 - Award negotiation in progress for 18-month study



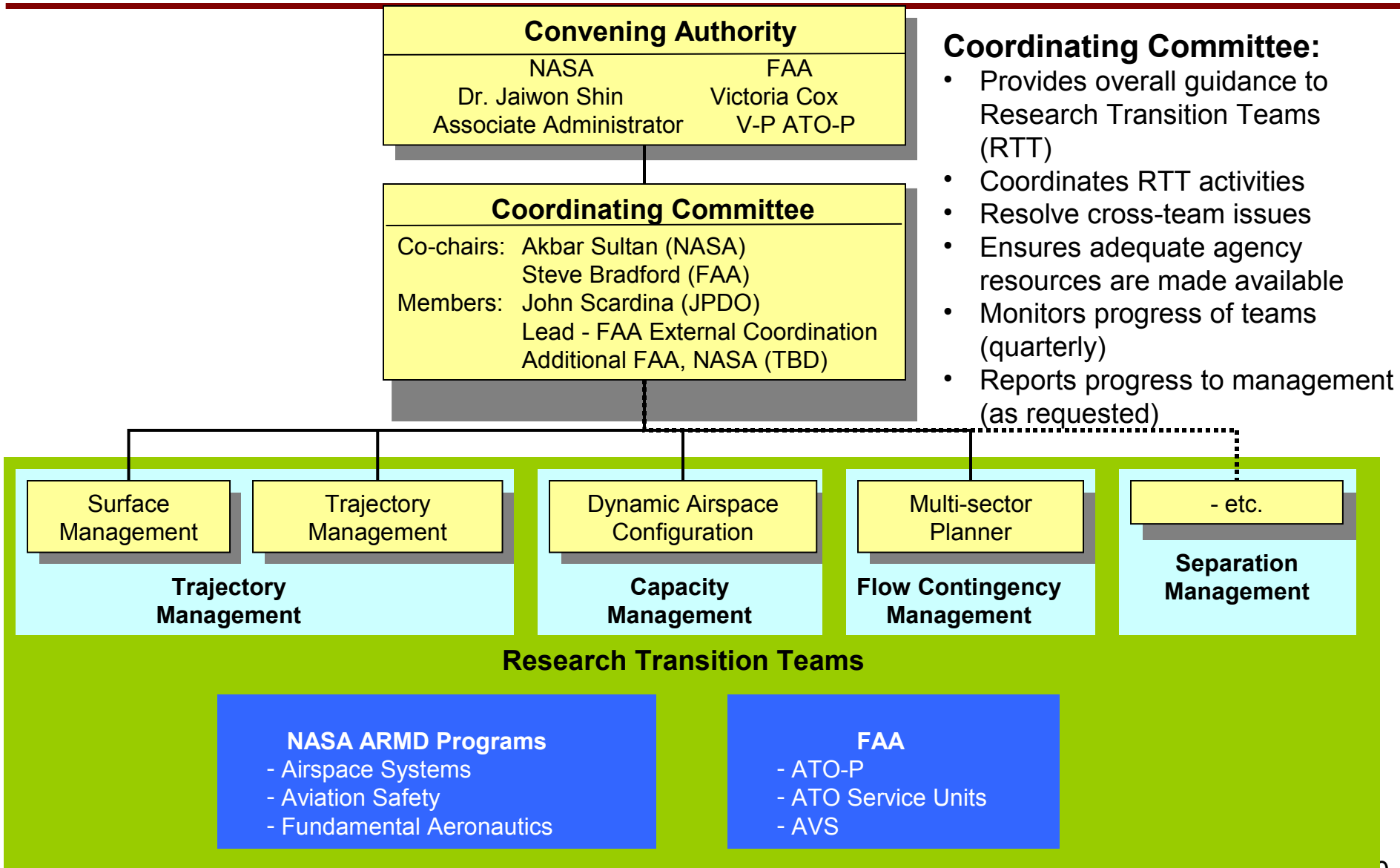


Knowledge Dissemination

Research Transition Strategy

- Goal: Ensure that R&D needed for NextGen implementation is identified, conducted, and effectively transitioned to the implementing agency
- Objectives:
 - Provide a structured forum for researchers and implementers to constructively work together on a continual basis
 - Ensure that planned research results can be fully utilized and will be sufficient to enable implementation of NextGen Operational Improvements

Research Transition Strategy

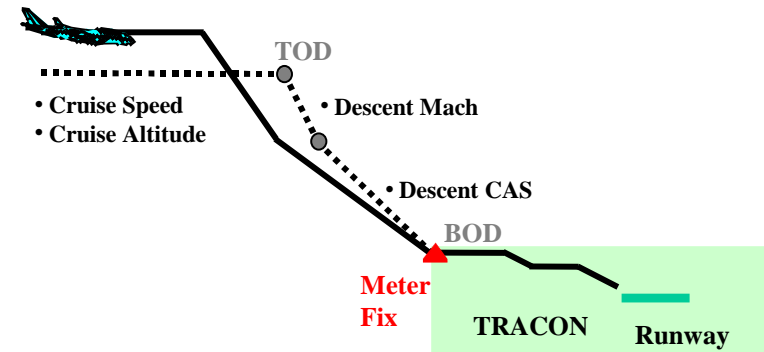


Summary of Research Transition Team (RTT) Actions

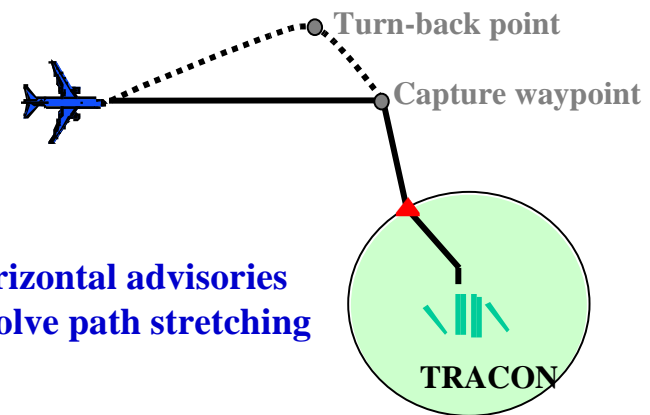
Oct. 2007	Approval to proceed given by Convening Authority
Nov. 2007	NASA and FAA appoint Co-Leads for four pilot RTTs for near, mid, and far term research
Dec. 2007	Coordinating Committee and RTT Co-Leads meet to: <ul style="list-style-type: none"> – Select Time Based Metering for near-term as the first workshop to determine best practices, and select 3D-PAM as the focus – Describe RTT; relationships to NextGen; workshop objectives and schedule
Jan. 2008	TM RTT Co-Leads planned agenda, participants, schedule and responsibilities for first RTT workshop
Feb. 2008	More than 35 participants from FAA service units, NASA, Mitre/CAASD and industry attended TM RTT Workshop in Washington, DC
Mar. 2008	Workshop co-leads to meet with Coordinating Committee <ul style="list-style-type: none"> – Lessons learned; establish scope for RTT; execution of action items
Spring 2008	Additional RTT Workshops planned for Apr - May 2008

Time Based Metering for Near-term Workshop Outcomes

- Exchange of research plans related to 3D-PAM
- Insight into the FAA AMS and its plans for 3D-PAM
- Actions for Time Based Metering for near term RTT:
 - Conflict Resolution needs for 3D PAM, testing for EDA, and vehicle for concept development delivery
 - Integration of NASA and FAA plans/schedules/roadmaps to support 3D PAM and identification of deliverables
 - Roadmap of how 3D-PAM research activities fit into the over-all NextGen far-term concept research objectives
 - Coordination on planned FY08 and FY09 FAA simulations for OMB, and collaboration for joint additional more complex validation simulations



Vertical advisories involve cruise speed, descent speed, and altitude

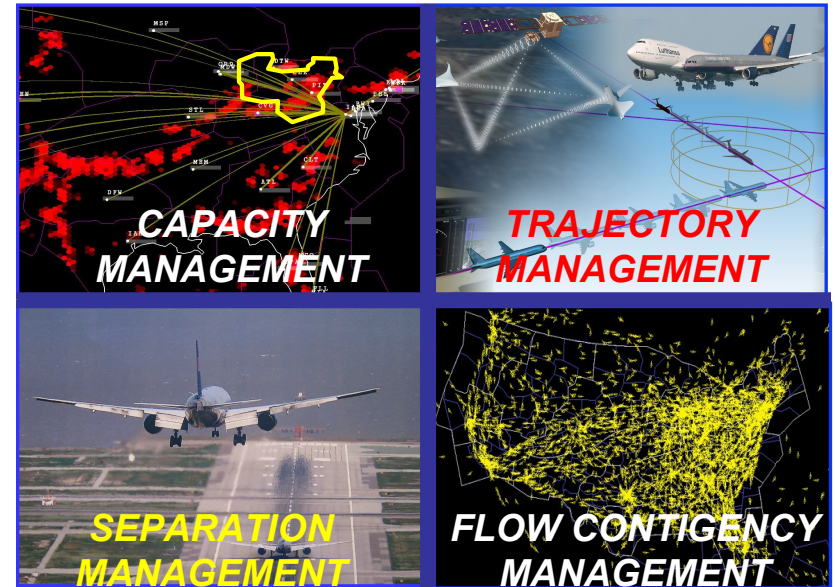


Horizontal advisories involve path stretching

Learn about NASA R&D

Technical Interchange Meeting on 18-20 March, 2008 at the Sheraton Austin, Texas

- This Airspace Systems Program forum will
 - facilitate the discussion of key long-term research issues for NextGen
 - update the community on NASA R&D
- Registration details are accessible from the JPDO home page or directly at <https://prv.grc.nasa.gov/evt/6>



Technical Tracks Organized
around Integrated Work Plan
Framework

Closing Remarks

- All three of NASA Aeronautics research programs conduct applied R&D for NextGen
- The “Research Opportunities in Aeronautics” NRA is a major component of the acquisition strategy
 - NRA topics cover a range of foundational through system-level R&D, all focused on NextGen
 - Details are posted on the aeronautics website
- NASA will continue to seek effective means to communicate progress toward this broad range of work
 - Research Transition Teams insure communication with implementers
 - Public technical interchange meetings provide feedback
 - Working Group briefings will inform the concept of operations